

Science Department

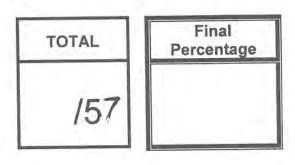
Year 12 Chemistry ATAR 2017

Redox - Fundamentals

Name:	Answers.	
Teacher: _		

Instructions to Students:

- 50 minutes permitted
- 2. Attempt all questions
- 3. Write in the spaces provided
- Show all working when required
- 5. All answers to be in blue or black pen, diagrams in pencil.



1 C 2 A 3. C 4 D 5. C



Year 12 Chemistry ATAR

REDOX - Fundamentals Test 2017

Total - 52 marks

Multiple Choice

- 1. Which one of the following reactions is an example of an oxidation-reduction reaction?
 - a) AgNO₃ + NaCl → NaNO₃ + AgCl
 - b) $H_3O^+ + OH^- \rightarrow 2H_2O$
 - (c) $2PbO + C \rightarrow 2Pb + CO_2$
 - d) H₂SO₄ + NaCl → NaHSO₄ + HCl
- 2. In the following equation:

$$Cu + 2NO_3^- + 4H^+ \rightarrow Cu^{2+} + 2NO_2 + 2H_2O$$

- (a)) nitrogen is reduced and copper is oxidized.
 - nitrogen is oxidized and oxygen is reduced.
 - c) nitrogen ion is oxidized and copper is reduced.
- d) there is no change in oxidation state.
- 3. Consider the following formulae:

V₂O₅ VO₂ VO₃ Mg₂V₂O₇

From the above information, it may be concluded that the oxidation number of vanadium (V) can be:

- a) +4, +5 and +6 and +7
- b) +2, +3 and +7
- (c)) +4, +5, +6
- d) +4, +5, +6 and +8

- 4. Which one of the following statements is FALSE?
 - a) Oxidation and Reduction occur simultaneously.
 - b) The substance which donates the electrons in an oxidationreduction reaction is called the reducing agent.
 - The oxidising agent is the substance which is reduced in an oxidation reduction reaction.
 - The reducing agent will experience a lowering of its oxidation state.
- 5. Which one of the following statements about redox reactions is FALSE?
 - The oxidising agent is reduced by gaining electrons from the reducing agent.
 - Reduction is the acceptance of electrons.
 - The stronger the reducing agent, the more electrons each atom can donate.
 - All electrons donated by the reducing agent are accepted by the oxidising agent.

Continued on next page

Short Answer Section

4	0	- 11	
1	Conside	ar the	reaction:

 $2Cu(s) \ + \ O_{2(g)} \ \rightarrow \ 2CuO(s)$

- (a) What substance is oxidised?
- (b) What substance is reduced?
- (c) What substance is the oxidant?
- (d) What substance is the reductant?
- (e) What substance donates or loses electrons?

Cu.

(f) What substance receives electrons?

Oz.

(g) Write the oxidation half reaction.

 $Cu \rightarrow Cu^{2+} + 2e^{-}$

(h) Write the reduction half reaction.

O2 +4e - 202-

(i) What is the change in oxidation number of the Cu(s)?

+2.

(j) What is the change in oxidation number of the O_{2(g)}?

-2

(10 marks)

2.	Write the two half equations, the overall reaction equation and what
	you would observe if solution of iron (II) sulfate is added drop-wise to
	an aqueous solution of hydrogen peroxide.

Half Eqn 1: $Fe^{2+} \rightarrow Fe^{3+} + e^{-}$ []

Half Eqn 2: $H_2O_2 + 2H^+ + 2e^{-} \rightarrow 2H_2O$ []

Combination: $2Fe^{2+} + H_2O_2 + 2H^+_{12e} \rightarrow 2Fe^{3+} + 2H_2O + 2e^{-}$ Final Equation: $2Fe^{2+} + H_2O_2 + 2H^+ \rightarrow 2Fe^{3+} + 2H_2O$ []

Observation: A clear, green liquids is added dropWise to a clear, colourless liquid. Upon

addition the solution turns light brown (orange)

in colour. []

(4 marks)

Write the two half equations and the overall reaction equation for a 3. solution of acidified potassium dichromate (K2Cr2O7) being added to an aqueous solution of sodium iodide (KI). Write a full observation for this reaction.

Half Eqn 1: $3(2I^- \rightarrow I_2 + 2e^-)$

Half Eqn 2: Cr2O72- + 14H+ + 6e- → 2Cr3+ + 7H2O (1

Combination: 61 + Cr2O72 + 14H1+ 6€ > 3I2 + 2Cr3+7H2O+6€

Final Equation: $6T + Cr_2O_7^2 + 14H^4 \rightarrow 3T_2 + 2Cr^{34} + 7H_2O(1)$

Observation: A clear, orange liquid is added to a

crear, colourless liquid. Upon addition the solution turns deep green in colour. (1)

(4 marks)

What is the oxidation number of:

a. Fe in Fe(s)

f. N in NO

b. Fe in FeClo

+2

N in NO2

each -

c. Fe in FeCl3

+3

N in NH4+

d. Zn in Zn(OH)₄²⁻

+2

i. N in HNO₃

+5

e. N in N2

0

Xe in HXeO41- +6

(5 marks)

Classify the following as either oxidising or reducing agents: 5.

Cl₂, Pb, Mn, MnO₄⁻, Fe³⁺, H⁺; I⁻, Ag⁺

Oxidising agents	Reducing agents
Cl ₂ MnO ₄ - Fe ³⁺	mn I-
Aq+	$(\frac{1}{2})$ each.

(4 marks)

	eduction lement in	or neith	followir er and	ng changes, give the ch	state v nange in	hether it is oxidation s	s oxidation, state of the
а	. VO ²⁺ -	→ VO ₂ +					
	+4	+5	Type:	axidatio	n 0	Change(∆)	: +1 ①
b	. S → S	S-2					
	0 -	2	Type:	reduction	0	Change(∆)	-20
C.	HClO ₂	→ ClO:					
	, ,	10	Type:	oxidatio	n 0	Change(∆)	120
d	H ₃ A ₅ O						
	+5	+3	Type:	reduction		Change(Δ)	-2(1)
							(8 marks)
VV	our worki	na to iusi	tify this	edicted you	must sta	te this as w	ell as show
a.	Copper	nitrate a	idded to	conclusion. potassium t			
a.		nitrate a	added to	potassium k	34V	$\begin{pmatrix} 1\\2 \end{pmatrix}$	
a.	Copper	nitrate a	added to	potassium b	34V	$\begin{pmatrix} \frac{1}{2} \\ \frac{1}{2} \end{pmatrix}$	
a.	Copper	nitrate a	added to	potassium k	34V 18V	1/2	
a	Copper Cu ²⁺ +Ze Br	nitrate a → (→> E	added to Cu Sr2 + 2 erall	potassium k +0 e -1.0 E = -	34V 98V 0.74V	1 2	<u> </u>
a	Copper Cu ²⁺ +Ze Br	nitrate a → (→> E	added to Cu Sr2 + 2 erall	potassium k + 0	34V 98V 0.74V	1 2	
a	Copper Cu ²⁺ +Ze Br	nitrate a → (→> E	added to Cu Sr2 + 2 erall	potassium k +0 e -1.0 E = -	34V 98V 0.74V	1 2	
a. 2	Copper Cu2++2e Br- Jegative	nitrate a	added to Cu Br ₂ + 2 erall value	potassium k +0 e -1.0 E = -	34V 18V 0.74V sponta	1 2	
a. 2	Copper Cu2++Zec Br- Jegative	nitrate a	odded to Cu Br2 + 2 erall value added	potassium k +0 e1.0 E= = not =	34V 0.74V Sponta	(1) neods.	
a. 2	Copper Cu2++zec Br- Segative	nitrate a	added to $3r_2 + 2$ erall value added	potassium k +0 e -1.0 E = not < to lead sulfar	34V 0.74V Sponta te -0.13	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$	
a. 2	Copper Cu2++zec Br- Segative	nitrate a	added to $\frac{3r_2+2}{\text{erall}}$ value $\frac{2}{2}$ $\frac{2}{2}$ $\frac{2}{2}$	to lead sulfar	34V 0.74V sponta te -0.13	neods. $V = \frac{1}{2}$ $V = \frac{1}{2}$	
a. 2	Copper Cu2++2ec Br- Segative	nitrate a	added to Cu Br2 + 2 erall value added c Cl2 erall	potassium k $+0$ $e^{-} -1.0$ $E^{\circ} = -$ $- not = 0$ to lead sulfare Pb $+ 2e^{-}$ $E^{\circ} = 0$	134V 18V 0.74V sponta te -0.13 -1.40	neods. $V = \frac{1}{2}$ $V = \frac{1}{2}$ $V = \frac{1}{2}$	
a. 2	Copper Cu2++2ec Br- Segative	nitrate a	added to Cu Br2 + 2 erall value added c Cl2 erall	to lead sulfar	134V 18V 0.74V sponta te -0.13 -1.40	neods. $V = \frac{1}{2}$ $V = \frac{1}{2}$ $V = \frac{1}{2}$	

-1-72 V Non sportaneous.

5n +2= > Sn +	-0.11	LV (
$2n \rightarrow 2n^{2+} + 2e^{-}$	+ 0.7		5)
$Sn^{2+} + Zn \rightarrow Sn + Zr$			1
Positive E° value, os			<u>(1)</u>
d. Hydrogen peroxide added to pore $2 (MnO_4^- + 8H^4 + 8e^- \Rightarrow 1)$ $5 (H_2O_2 \rightarrow O_2 + 6H^4 \rightarrow 2n)$ $2 mnO_4^- + 5H_2O_2 + 6H^4 \rightarrow 2n)$ $2 mnO_4^- + 5H_2O_2 + 6H^4 \rightarrow 2n)$	$mn^{2+} + 4H_2Q^2$ $2H^4 + 2e^2$ $mn^{2+} + 5Q_2 + 4$ spontan) +1.5 -0.7 8H20	70V. (+ + 0.8
e. Silver nitrate added to oxalic act $2(Ag^{+} + e^{-} \rightarrow Ag)$ $H_{2}O_{2}O_{4} \longrightarrow 2CO_{2}$ $2Ag^{+} + H_{2}O_{2}O_{4} \longrightarrow 2CO_{2}$	+ 2H++2e-	+	0-80V 0-43V 1-23V
$\frac{2(Ag^{+} + e^{-} \rightarrow Ag)}{H_{2}O_{2}O_{4}} \rightarrow \frac{2CO_{2}}{2Ag^{+} + H_{2}O_{2}O_{4}} \rightarrow \frac{2CO_{2}}{Positive}$ Positive E° value &	+ 2H++2e= + 2H++2Ag Spontaine	+ + cus. (0.43V(1.23V(1)
$\frac{2(Ag^{+} + e^{-} \rightarrow Ag)}{H_{2}C_{2}O_{4}} \rightarrow \frac{2CO_{2}}{2CO_{2}}$ $\frac{2Ag^{+} + H_{2}C_{2}O_{4} \rightarrow 2CO_{2}}{Positive E^{\circ} value e^{\circ}}$ $\frac{2(Ag^{+} + e^{-} \rightarrow Ag)}{2CO_{2}} \rightarrow \frac{2CO_{2}}{2CO_{2}}$ $\frac{2Ag^{+} + H_{2}C_{2}O_{4} \rightarrow 2CO_{2}}{Positive E^{\circ} value e^{\circ}}$ $\frac{2(Ag^{+} + e^{-} \rightarrow Ag)}{2CO_{2}} \rightarrow \frac{2CO_{2}}{2CO_{2}}$ $\frac{2Ag^{+} + H_{2}C_{2}O_{4} \rightarrow 2CO_{2}}{Positive E^{\circ} value e^{\circ}}$ $\frac{2}{Positive E^{\circ} value e^{\circ}}$ $\frac{2}{Po$	+ 2H++2e- + 2H++2Ag Spontaine eacher to select ducing agent f	t the mo	0.43v(
$2(Ag^{+} + e^{-} \rightarrow Ag)$ $H_{2}C_{2}O_{4} \rightarrow 2CO_{2}$ $2Ag^{+} + H_{2}C_{2}O_{4} \rightarrow 2CO_{2}$ $Positive E^{\circ} \text{ value } e^{\circ}$ $Ing agent and most powerful recalls listed below. Indicate your choinness of the powerful recalls listed below. Indicate Indicate = Indicate Ind$	+ 2H++2e- + 2H++2Ag Spontaine eacher to select ducing agent f	t the mo	0.43v(
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